U.S. DEPARTMENT OF
ENERGY
Office of Electricity Delivery and Energy Reliability

American Recovery and Reinvestment Act
Smart Grid Demonstration Program

Aquion Energy Inc
Sodium-ion Battery for Grid-level Applications

Project Description

Aquion Energy and its partners will demonstrate a low cost, grid-scale, ambient temperature sodium-ion energy storage device. The energy storage chemistry in this device uses an electrochemical couple that combines a high capacity carbon anode with a sodium intercalation cathode capable of thousands of deep discharge cycles over extended periods of time. The proposed aqueous sodium-ion technology includes the use of thicker electrodes, less expensive separator and current collector materials, and the use of benign materials for electrodes and electrolyte salts. This project will progress the work from bench-scale to pilot-scale enabling multiple ampere-hour cells to be manufactured and assembled into test batteries. Aquion plans to site units between 10 kWh and 100 kWh capacity that have the ability to perform medium to long duration (more than 2 hours) charge and discharge functions with greater than 95 percent DC-DC efficiency. The units will be safe and environmentally benign. Testing will characterize the energy storage capacity of the units, the response to various signals, compliance with utility interconnection standards, battery and power conversion system efficiency, and effectiveness under various cycles typical of the applications being validated. Utility application-level testing will test the functionality of the unit with respect to its ability to respond to external control signals and properly interact with electric grid in carrying out relevant sequences. The pilot line will be commissioned for production at the end of the project.

Goals/Objectives

- Projected capital cost less than $250/kWh at pack level
- Deep discharge cycle life of greater than 10,000 cycles
- Volumetric energy density of greater than 20kWh/m^3
- Calendar life of over 10 years
- Build and install multiple 100 kWh batteries

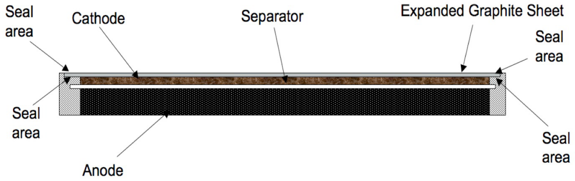
Key Milestones

- ***Advanced battery design qualified (April 2011)***
- ***Full pilot production qualified (August 2011)***
- ***Prototype battery demonstrated (July 2012)***

Benefits

- Jobs created
- Electricity costs decreased
- Greenhouse gas emissions reduced
- Power reliability increased

The Unit Cell



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PARTNERS

Carnegie Mellon University
AES

PROJECT DURATION

08/1/10–07/31/13

BUDGET

Total Project Value
$10,359,827

DOE/Non-DOE Share
$5,179,000/$5,180,827

EQUIPMENT

Battery Tester
Electrode Processing Equipment
Pilot Attritor Mill
Particle Size Analyzer
Automated Cell Production Line

DEMONSTRATION STATES

Pennsylvania
CID: OE0000226

Managed by the National Energy Technology Laboratory for the Office of Electricity Delivery and Energy Reliability

December 2010